GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT INITIATION

Date: May 14, 1974

Project Title: "Study and Analysis of Fire Plow Parts"

Project No.: A-1623

Project Director: Mr. Henry P. Cotten

Sponsor: Georgia Forestry Commission; Macon, Georgia

Effective May 9, 1974 Estimated to run until June 9, 1974 (approx.)

Type Agreement: Letter dated 3-29-74 Amount: $ 1,645.00

Reports Required: Final Technical Letter

Sponsor Contact Person (s):

Mr. George Sanders
Georgia Forestry Commission
P.O. Box 819
5156 Riggins Mill Road
Macon, Georgia 31202

Assigned to SENSOR SYSTEMS Division

COPIES TO:

- ☐ Project Director
- ☐ Director
- ☐ Assistant Director
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RA-73

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station

PROJECT TERMINATION

Date Sept. 10, 1974

PROJECT TITLE: Study & Analysis of Fire Plow Parts

PROJECT NO: A-1623

PROJECT DIRECTOR: Mr. Henry P. Cotten

SPONSOR: Georgia Forestry Commission; Macon, Ga.

TERMINATION EFFECTIVE: 6-25-74 (Preliminary Prints & Tech. Ltr. submitted)

CHARGES SHOULD CLEAR ACCOUNTING BY: 6-30-74

Contract Closeout Items Remaining: Final Invoice as soon as all charges clear.

Sensor Systems Division

COPIES TO:

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GTRI EES 403 (R10-80)

File: A-1623

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

11 September 1974

Georgia Forestry Commission
P. O. Box 819
Macon, Georgia 31202

Attention: Mr. George Sanders

Subject: Final Technical Letter Report on
"Study and Analysis of Fire Plow Parts"
EES/GIT Project A-1623

Dear Mr. Sanders:

The purpose of this letter is to summarize the work performed on the subject contract.

A. BACKGROUND

The Georgia Forestry Commission contacted the Engineering Experiment Station (EES) at the Georgia Institute of Technology through Mr. Jerry Birchfield of EES to obtain help in redesigning some castings used on fire plows. The castings were produced by a foundry that has gone out of business. As castings are expensive and time consuming to produce, the commission felt that these components could be better fabricated by utilizing welded construction. A proposal (ST-SSD-74-033) was prepared in which the Sensor Systems Division of EES offered to assist the Forestry Commission in analyzing the parts and to produce drawings so that the parts could be fabricated by welding. This letter summarizes the work done by EES under the resulting contract.

B. WORK DONE

The fire plow parts were disassembled and accurate measurements made to assist in analyzing and drawing the parts. The original parts were cast from a steel similar to AISI-4140 steel. This is a high-strength hardenable alloy steel which has an annealed yield strength of approximately 60,000 psi. In analyzing the parts, this type of steel strength was used so that the new parts would remain the same size.

The redesigned parts use rod, tubing, and plate to form each component. Since the structures are welded, the weld fillet size was calculated to give the same strength as the original castings. After these calculations were performed, Drawings A-1623-1-M5, -2-M4, -3-M4, and -4-M3 were produced of the various parts. Copies were sent to the commission for their approval.

C. RECOMMENDATIONS

To keep the same strength in the weld, the welding should be done with a high-strength welding rod, example E10016 (ultimate strength = 100 ksi). The parts should be preheated to 550°F in order to avoid rapid cooling, which would cause brittleness. The welded structure should be stress-relieved at 1150°F before final machining.

The 4140 steel can be heat treated to a higher hardness than the 60,000 psi yield strength. One method is to heat the parts to 1550°F, then oil quench, and finally temper at 1,000°F. This will produce a yield strength of approximately 100,000 psi. The heat-treat process should be carefully done to try to eliminate warpage that could occur.

The original drawings will be sent to you separately.

As always, if you should have any questions or any problems, please do not hesitate to call.

Yours very truly,

Henry P. Cotten
Project Director

HPC:dab